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Educational Level and the Quality of Life of Heart Failure Patients: A Longitudinal Study

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ABSTRACT

Background: Lower education in heart failure (HF) patients is associated with high levels of anxiety, limited physical functioning, and an increased risk of hospitalization. We examined whether educational level is related to longitudinal differences in quality of life (QoL) in HF patients.

Methods and Results: This research is a substudy of the Coordinating study evaluating Outcomes of Advising and Counselling in Heart failure (COACH). QoL of 553 HF patients (mean age 69, 38% female, mean left ventricular ejection fraction 33%) was assessed during their hospitalization and at 4 follow-up measurements after discharge. In total 32% of the patients had very low, 24% low, 32% medium, and 12% high education. Patients with low educational levels reported the worst QoL. Significant differences between educational groups ($P < .05$) were only reported in physical functioning, social functioning, energy/fatigue, pain, and limitations in role functioning related to emotional problems. Longitudinal results show that a significantly higher proportion of high-educated patients improved in functional limitations related to emotional problems over time compared with lower-educated patients ($P < .05$).

Conclusions: Patients with low educational levels reported the worst physical and functional condition. High-educated patients improved more than the other patients in functional limitations related to emotional problems over time. Low-educated patients may require different levels of intervention to improve their physical and functional condition. (*J Cardiac Fail* 2011;17:47–53)

Key Words: Socioeconomic factors, hospitalization, psychosocial resources, health disparities.

The quality of life (QoL) of heart failure (HF) patients is known to be poor compared with age- and gender-matched healthy persons, as well as with patients with other chronic diseases.¹ Low socioeconomic status (SES) among HF patients is one of the factors associated with poorer QoL, higher mortality, decreased compliance, and repeated hospital readmissions.^{2–7} Only a few cross-sectional studies

have addressed low SES as one of the significant factors associated with lower levels of QoL in HF patients.^{8,9} Furthermore, a prospective study on coronary heart disease (which also included HF patients) showed that low SES was related to worse QoL in functional domains up to 1 year after the diagnosis.¹⁰ There is no direct evidence supporting the notion that SES determines QoL disparities among HF patients over time.

Previous studies have shown a relationship between lower educational level in HF patients and various aspects of QoL, such as higher anxiety, lower levels of physical functioning, and poorer general health ratings.¹¹ Additionally, low-educated HF patients were less likely to receive care from a cardiologist,² and reported more than a 50% increase in the risk of hospitalization compared with high-educated patients.¹² Hence, educational level is considered a valid proxy for SES in medical research.

The present study intends to: 1) examine the association between educational level and QoL at 4 assessment points and 2) observe whether educational level is related to changes in QoL over time (from HF hospitalization to 18 months after discharge).

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Methods

We performed secondary analyses using data from the Coordinating study evaluating Outcomes of Advising and Counselling in Heart failure (COACH). COACH is a multicenter study involving 17 hospitals in the Netherlands aimed at studying the effect of education and counseling in HF patients.^{13,14} For the present research, we focused on educational disparities.

Procedure

After confirmation of suitability and informed consent, 1023 patients were included in the COACH study between November 2002 and February 2005 and were followed for 18 months. The main inclusion criteria were a hospitalization for symptomatic HF and documented underlying heart disease. Patients were excluded if they were younger than 18 years of age, had received an invasive cardiac intervention during the 6 months before their hospitalization (percutaneous transluminal coronary angioplasty, coronary artery bypass graft, heart transplant, valve replacement), or had such an intervention planned in the coming 3 months, were already included in another study or were under evaluation for heart transplantation, had severe restrictions that made them unable to fill in the data collection forms, or were unable or unwilling to give informed consent.

After inclusion, patients were randomly assigned into one of the following advising and counseling (A&C) strategy: 1) basic support, 2) intensive support, or 3) a control group. Basic support consisted of patient education, additional visits to a HF nurse every 3 months, and telephone access to a HF nurse during office hours. Intensive support additionally included monthly contact with a HF nurse, multidisciplinary advices, home visits, and 24-hour access to a HF team during 18 months. Patients assigned to the control group received routine management by the cardiologist and general practitioner. No additional follow-up by a HF nurse was provided.

Information on the clinical conditions and sociodemographic characteristics of the patients was collected from medical records and interviews at baseline assessment (admission to the hospital). Baseline data on QoL were collected at hospital admission through structured interviews and questionnaires. Four follow-up assessments took place at 1, 6, 12, and 18 months after discharge by means of interviews at the patients' homes carried out by trained, independent data collectors. When possible, patients were invited to fill in the questionnaires by themselves. If any patient showed difficulties in reading or writing, well-trained collectors would have helped them in completing the questionnaires.

For the present study, we selected 553 patients of known educational level who responded to all 5 assessments of QoL. Of the remaining 470 patients who did not respond, 40% died during the study. We compared participants with nonresponders at baseline. Participants were significantly younger (mean age 69 ± 11 versus 73 ± 11 , $P < .001$) and reported fewer chronic conditions (mean number of diseases 1.5 ± 1.4 versus 1.9 ± 1.9 , $P < .001$), better physical functioning (mean 39 ± 27 versus 30 ± 24 , $P < .001$) and better general well-being (mean 45 ± 19 versus 42 ± 18 , $P = .027$).

The COACH study was approved by the medical ethical committee of the University Medical Centre of Groningen in compliance with the declaration of Helsinki.

Measures

QoL was quantified using 35 items of the RAND 36-Item Health Survey (Version 1.0), grouped into 8 scales: emotional well-being (5 items), energy/fatigue (4 items), social functioning (2 items), physical functioning (10 items), pain (2 items), general health (5 items), limitations in role functioning from personal or emotional problems (3 items), and limitations in role functioning from physical health problems (4 items). We excluded a single-item scale that provides an indication of perceived change in health within 1 year, because changes in QoL were more accurately quantified by comparing the scores between different assessments. All the scales range from 0 to 100, with high scores indicating a more favorable health state. The psychometric qualities and other properties of the Dutch version of the RAND 36 have been discussed in previous studies.^{15,16}

Educational level was used as index of SES. Compared with other socioeconomic indexes, educational level better represents the sociocultural part of SES, reflects more stably the individual situation of the subject,¹⁷⁻¹⁹ is strongly related to personal psychosocial resources,²⁰ and positively affects emotional well-being.²¹ Educational level was defined as the highest level of education attained by the patient, with the score ranging from 1 (elementary school) to 8 (higher education, second phase). These scores were then recoded into 4 categories to represent groups with distinct backgrounds: 1) very low (elementary school attended between 5 and 12 years of age), 2) low (vocational and technical education attended between 12 and 16 years of age), 3) medium (general secondary education in preparation to higher education and vocational education higher level, attended between 12 and 18 years of age), and 4) high (professional higher education, university education, starting at 18 years of age).

Other clinical and demographic characteristics, considered in the literature as candidate variables for adjustment in cardiac disease,^{22,23} were collected at baseline from the patient's medical chart and through interviews. The following characteristics were included as covariates: age, gender, left ventricular ejection fraction (LVEF), and number of active chronic conditions (comorbidity). The chronic conditions considered in the latter variable included diabetes, stroke, chronic obstructive pulmonary disease, asthma, kidney disease, liver disease, gastrointestinal disease, hypertension, peripheral arterial disease, and arthritis.

Statistical Analyses

We first performed a bivariate correlation analysis using educational level, the 8 scales of QoL, gender, age, LVEF, and comorbidity to study the associations between the variables included in the subsequent analyses.

To examine the relationship between educational level and QoL at different assessment points, we compared mean values of the outcome variables between the 4 groups with different educational levels, and adjusted for covariates by using analysis of covariance.

We measured longitudinal change for each aspect of QoL by calculating difference scores and classifying whether the reported value increased (positive scores), decreased (negative scores), or remained stable (0 scores) between baseline (hospitalization) and the third follow-up assessment (18 months after discharge). The distribution of patients across these 3 categories for different domains of QoL provided an overview of the general longitudinal trends for each educational level.

To evaluate the actual extent of such changes, we tested whether the difference scores for each aspect of QoL differed between

educational groups using an additional analysis of covariance. However, the average baseline scores are not necessarily the same for each educational group and initial disparities might bias the estimated change over time. For example, individuals reporting low scores of QoL at hospitalization might show a larger improvement over time simply because they started from a lower level. To avoid the possibility of such a systematic error, we included the baseline measurement of the dependent variable as a covariate in this last series of analyses.

Results

The sample included 62% men, a small number (12%) of high-educated patients and the average age was 69 years (Table 1). Mean LVEF was 33%, and the average number of other chronic conditions was 1.4. The high-educated patients were younger (mean age 66 ± 13), more often male (81%), and had fewer comorbid conditions (mean 1.1 ± 1.1), especially when compared with the very low-educated patients. About 70% of the participants in the whole group, as well as in each educational group, have received an A&C intervention. Once tested, there were no significant differences in proportions of participants assigned to intervention between the educational groups ($\chi^2(3, n = 503) = 0.5, P = 0.9$).

Relations between Educational Level, Age, Gender, LVEF, Comorbidity, and QoL

As presented in Table 2, educational level was lower among women and was negatively related to age and the number of comorbidities. Weak but significant positive correlations with educational level were found at multiple assessment points for domains of QoL such as physical functioning, role limitations from emotional problems, energy/fatigue, and pain. Interestingly, excluding physical functioning, in the other domains, significant positive correlations were only reported at certain assessments. For instance, role limitations from physical problems is not significantly correlated with educational level at baseline and at 2 and 12 months afterwards, whereas it results positively correlated at 6 and 18 months. Positive correlations with educational level were found at a single assessment point for emotional well-being (6 months), social functioning (18 months), role limitations from physical problems (18 months), and general health (12 months).

Differences in QoL between Educational Levels at Different Assessments

Overall differences between the educational groups were found for energy/fatigue, social functioning, physical functioning, pain, and role limitations from emotional problems (Table 3). In these various domains, differences were found mostly between the low/very low-educated groups and the high-educated group. Very low-educated patients reported significantly more fatigue than patients with low and medium education at the baseline. Low-educated patients reported significantly worse social functioning than all the other educational groups at 6 months. Very low-educated patients had a significantly lower physical functioning than high-educated patients at 6 and 18 months and low-educated patients reported significantly lower physical functioning than high-educated patients at 6 months. Low-educated patients reported significantly higher levels of pain than participants of all the other educational groups at 6 months. Finally, patients with (very) low education reported significantly worse role limitations from emotional problems than high-educated patients at 18 months.

Longitudinal Changes in QoL

Educational disparities between groups of HF patients who increased, decreased, or maintained their original level of QoL were mostly present in domains such as social functioning, physical functioning, pain, and limitations in role functioning from emotional problems (Fig. 1).

Twenty percent of the very low-educated and 18% of the low-educated patients declined in social functioning, compared with only 12% of those with medium and 8% of those with high education. In total, 51% of the patients in the high-educated group increased their social functioning from baseline, compared with 44% of those with very low, 47% with low, and 48% with medium education.

Patients with medium education showed the highest rate of recovery in physical functioning (49% of the group), compared with those with very low (43%), low (26%), and high (23%) education. Moreover, 29% of patients with very low education, 26% of those with low, and 23% of those with medium and high education reported a decrease in physical functioning from baseline. Finally, 34% of the high-educated patients did not change their level of physical functioning from baseline, compared with 26% to 27% of those in the (very) low and medium educational groups.

Table 1. Characteristics of the Sample at Admission to the Hospital

	Total Sample 100% (n = 553)	VL 32% (n = 176)	L 24% (n = 134)	M 32% (n = 179)	H 12% (n = 64)
Females (n)	38% (210)	49% (86)	32% (43)	38% (69)	19% (12)
Age, mean (SD)	69 (11)	73 (9)	67 (10)	67 (12)	66 (13)
Comorbidity, mean (SD)	1.4 (1)	1.6 (1)	1.5 (1)	1.3 (1)	1.1 (1)
LVEF (SD)	0.33 (14)	0.33 (14)	0.33 (15)	0.33 (14)	0.30 (13)
Received an A&C (n)	68.9% (381)	69.3% (122)	69.4% (93)	67.1% (120)	71.9% (46)

LVEF, left ventricular ejection fraction; A&C, advising and counseling support; VL, very low education; L, low education; M, medium education; H, high education.

Table 2. Correlations Between Educational Level, Covariates and QoL at Different Assessment Points

	Educational Level				
	Baseline	1 Month	6 Months	12 Months	18 Months
Gender	−0.16***	—	—	—	—
Age	−0.22***	—	—	—	—
LVEF	−0.06	—	—	—	—
Comorbidity	−0.10*	—	—	—	—
Type of intervention	0.05	—	—	—	—
Emotional well-being	0.05	0.08	0.10*	0.03	0.07
Role limitations due to emotional problems	0.01	0.12**	0.15***	0.10*	0.14**
Energy/fatigue	0.10*	0.02	0.09*	0.13**	0.12**
Social functioning	0.00	−0.05	0.05	0.02	0.10*
Physical functioning	0.14**	0.17***	0.21***	0.20***	0.21***
Role limitations due to physical problems	0.07	0.04	0.10*	0.06	0.11*
Pain	0.11**	0.12**	0.09*	0.10*	0.05
General health	0.08	0.03	0.02	0.10*	0.08

LVEF, left ventricular ejection fraction.

* $P < .05$.

** $P < .01$.

*** $P < .001$.

Forty-one percent of the group with very low education reported a reduction in their suffering from physical pain, which was the biggest improvement compared with the other groups (30% to 34%). Furthermore, 54% of the low-educated patients did not change their level of physical pain from baseline, compared with 40% to 45% of the other educational groups. Regarding limitations in role functioning from emotional problems, 21% to 22% of (very) low- and medium-educated patients reported a decrease, in contrast to only 9% of high-educated patients. The high-educated group also had a higher percentage of participants who improved (48%) in this domain compared with the other groups (30% to 39%).

When we compared the mean differences in the various domains of QoL between baseline and 18 months after discharge, we found only that high-educated patients significantly improved in terms of limitations in role functioning because of emotional problems, compared with the other 3 educational groups ($F(3, 473) = 3.5$, $P = .015$). This difference was significant when high-educated patients were contrasted with those with low and very low educational level ($P < .01$).

Discussion

This study examined whether cross-sectional and longitudinal differences in QoL of HF patients were attributable to educational level, independently of other clinical and sociodemographic factors. We found better QoL for high-educated patients in physical and functional domains, specifically in physical functioning, energy/fatigue, social functioning, and limitations in role functioning related to emotional problems.

The greatest inequalities were found when the high-educated patients were compared with the low- and very low-educated groups. It is noteworthy that multiple positive

correlations between educational level and certain domains of QoL (ie, role limitations from emotional problems, energy, role limitations from physical problems, and pain) are not constant at different assessment points. Similarly, when we compared the groups, we found significant differences in physical functioning at 6 and 18 months but not at 12 or prior assessment points. Although we could not come up with any explanation for this phenomenon, the results might offer some indications of when educational disparities are salient for coping with adversities in different areas of the patient's QoL during the course of the HF. Future studies should replicate these associations using different samples to reach some conclusions and properly estimate the random effect of the findings. However, when we examined the differences over time, we found that high-educated patients improved significantly (compared with the other groups) only in relation to limitations in role functioning because of emotional problems. Both cross-sectional and longitudinal differences in those limitations were clearly marked between high- and low-educated patients. Such a result appears to contradict that we did not find any inequality in relation to emotional well-being. This incongruent finding can be explained by the reserve capacity model, which states that people with low SES are more exposed to stressful situations and live in an environment that prevents the development of new resources.²⁴ This could partially explain why people with low SES are more likely to report poorer health outcomes.²⁵ Furthermore, long-term exposure to stress progressively reduces the resources available, leaving the individual even more vulnerable when exposed to new stressors.²⁶ In other words, resources of low-SES people are more limited and tend to degrade, resulting in worse health in response to stressful situations, when compared with high-SES people. In the present study, the same level of emotional problems experienced by HF patients with different educational backgrounds, might have produced

Table 3. Differences in QoL Between Educational Groups at Different Assessment Points

Variables	Baseline						1 Month						6 Months						12 Months						18 Months					
	Educational Levels						Educational Levels						Educational Levels						Educational Levels						Educational Levels					
	Mean						Mean						Mean						Mean						Mean					
	VL	L	M	H	F		VL	L	M	H	F		VL	L	M	H	F		VL	L	M	H	F		VL	L	M	H	F	
Emotional well-being	66	65	67	70	0.6		69	69	71	74	0.5		70	70	75	77	2.2		74.1	73	73	77	0.7		74	74	72	75	79	1.1
Energy/fatigue	36	43 ^{VL**}	42 ^{VL*}	43 ^{VL**}	2.9*		48	48	49	50	0.1		53	53	56	59	0.5		54	55	57	64	1.7		52	55	56	62	1.6	
Social functioning	52	55	51	53	0.6		59	60	58	53	2.2		63 ^{VL**}	71*	71*	73 ^{L*}	3.2*		71	71	71	74	0.2		67	72	72	76	0.7	
Physical functioning	34	40	39	49	1.4		39	45	49	52	1.6		47	47	53	60 ^{VL**}	2.6*		41	48	51	59	2.2		40	48	50	60 ^{L**}	2.7*	
Pain	61	67	68	71	1.3		72	72	77	82	1.2		75	72 ^{VL*}	77 ^{L*}	84 ^{L*}	2.7*		75	72	78	85	2.5		75	75	77	78	0.3	
General health	43	44	45	49	1.0		45	44	45	48	0.2		45	45	48	49	0.3		46	47	49	52	1.0		45	47	48	50	0.8	
Emotional limitations	52	52	55	51	0.8		44	42	50	64	1.6		57	58	68	77	2.5		62	62	70	75	1.1		62	60	68	84 ^{VL**}	2.9*	
Physical limitations	16	21	21	24	0.8		20	18	21	25	0.2		32	32	40	50	1.7		41	43	44	52	0.4		38	38	46	53	1.0	

VL, very low education; L, low education; M, medium education; H, high education.

Superscripts indicate results of significant post-hoc tests between groups.

Analysis of covariance: * $P < .05$; ** $P < .01$. Results adjusted for gender, age, left ventricular ejection fraction, comorbidity, and type of intervention.

different limitations in role functioning because of inequalities in resources among the groups. In other domains of QoL, such as energy/fatigue, social functioning, and physical functioning, cross-sectional differences were not accompanied by longitudinal differences.

Generally, physical domains were found to be particularly compromised during hospitalization, because the lowest scores at the baseline were reported in energy/fatigue, physical functioning, and limitations in role functioning from physical problems. Inequalities related to educational level were reported in domains that represented the functional status of the patients (physical, social, and role functioning). HF patients have been shown to already be worse off in their functional status at a premonitory stage when compared with a reference group.²⁷ In this case, disparities may be due to the fact that high education is related to a higher level of self-efficacy, which has been found to mediate the relation between SES and physical functioning in heart disease patients.²⁸ Both contextual and personal resources are involved in the relation between low education and QoL. However, research on socioeconomic disparities in health and heart disease has increasingly supported the notion that unfavorable outcomes are partly dependent on the availability of psychosocial coping resources, such as social support and control.^{28–30}

Most of the patients in our sample increased their QoL between their admission to the hospital and 18 months after discharge. Generally, a HF admission is accompanied by severe symptoms that can result in impaired QoL. Patients who survive this phase are expected to recover and stabilize at a higher level. This is what we observed in the largest part of our sample. It is therefore striking that a relatively large number of patients deteriorated further in various domains, ranging from 15% in limitations in role functioning from physical problems, to 32% in general health. An important direction for future research is to define more sharply the characteristics of the subgroup of patients who deteriorate in each domain. This will help to address the specific needs of those patients who have more difficulties coping with the consequences of HF during the last phases of their life.³¹

Information about the type of jobs attended by the patients during their life might have added more knowledge about functional disparities between educational groups. More exhausting types of jobs, which are generally associated with lower academic achievements, may have contributed to the depletion of resources and to increased health problems that could have accumulated over time. Therefore we cannot exclude that educational disparities in health and functioning in our study might be mediated by the types of job attended by the participants during life.

Previous research identified low SES as a factor associated with reduced compliance to medical regimens in HF patients.⁷ It might be that low educated patients have more difficulties to follow complex medical procedures, which results in poor health and QoL. Future studies on educational level and QoL in HF should include compliance with medical regimens.

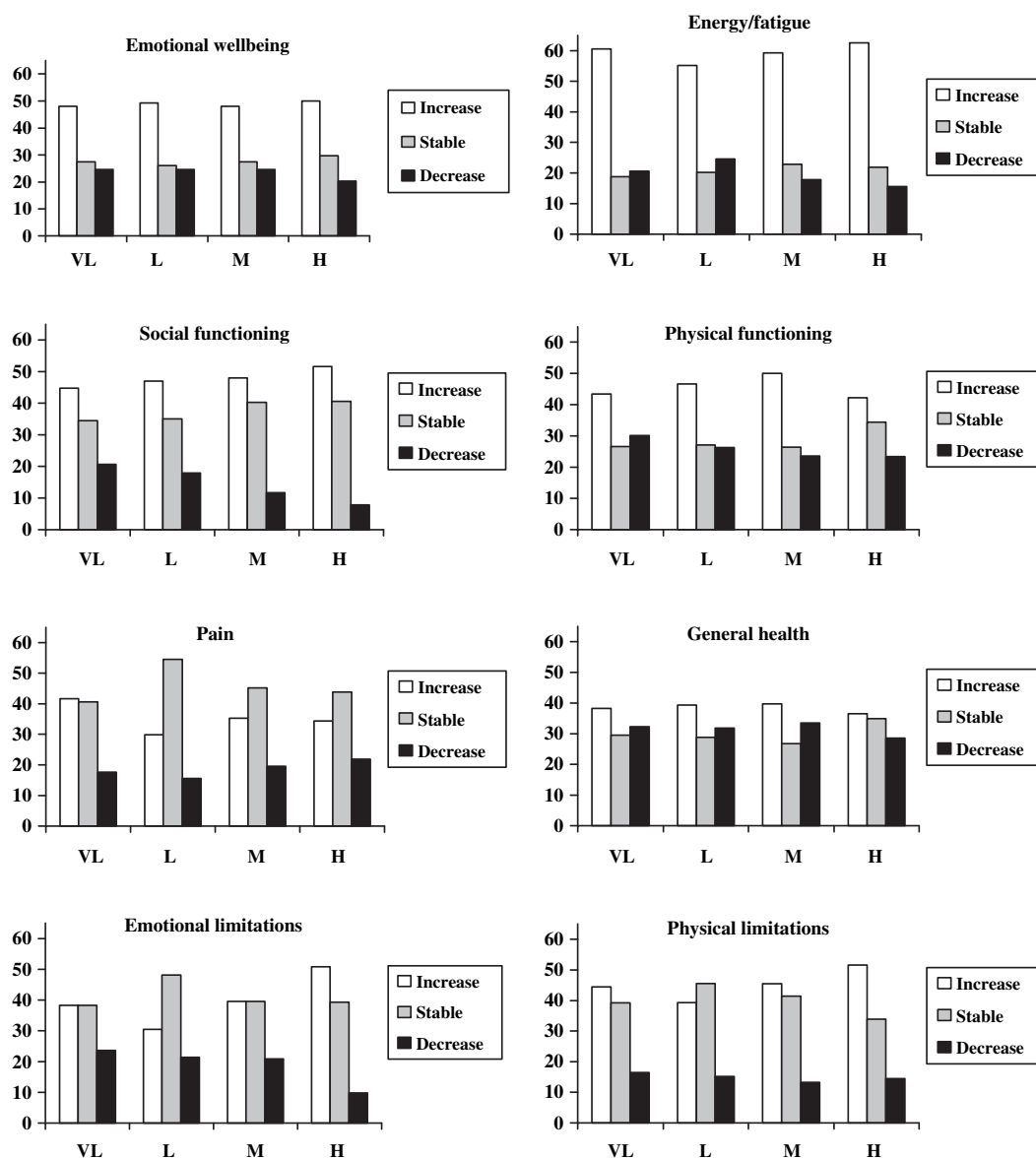


Fig. 1. Percentages of patients who increased, stabilised or decreased in quality of life between their admission and 18 months after discharge. VL, very low education; L, low education; M, medium education; H, high education.

A possible limitation of the present study is the lack of pre-morbid measurements of QoL. It might be that the educational differences in some domains of QoL were not a consequence of HF, but instead the aggravation of a pre-morbid situation, as previously showed by a study on heart disease patients.¹⁰ Such premorbid differences may have been present in the current sample too, so we cannot take for granted that educational differences in QoL are a direct response to the disease. Further studies reporting premorbid information of the sample would help to understand the full impact of HF on the patients' QoL.

The educational groups resulted homogeneous in proportions of participants who have been assigned to intervention. This excludes that our findings could have been primarily biased by an uneven distribution of intervention among educational groups. However, it might be that

participants with different educational background responded differently to the intervention; for instance, high-educated patients might be more compliant to treatments because of a deeper understanding of the information offered by doctors and nurses during the intervention. Further research should explore this issue more thoughtfully.

Another point for consideration is that for this study, we selected only those patients who responded to all assessments. As reported in the description of the sample, participants were significantly younger and better off in terms of comorbidity, physical functioning, and general well-being as compared with nonparticipants. Furthermore, about 40% of the nonparticipants did not respond because they died within 18 months of being discharged. The participants might therefore represent a subgroup of patients who adapted better after discharge, enhancing their chances

of surviving or at least being capable of respond to further assessments. Nonetheless, this is not necessarily a bias for the present study, because the main purpose of this research was to describe the QoL of patients surviving HF.

The findings of our study may imply that low-educated HF patients require more interventions aimed at improving their physical and functional status. Health care providers might consider including psychological counseling or medical interventions that reduce emotional distress in the rehabilitation programs of low-educated HF patients with limited daily functioning. There is a need for further longitudinal studies to clarify the role of education in the process of adjustment to HF.

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Disclosures

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